8-18-00 A

JC907 U.S. PTO 08/17/00

PATENT APPLICATION TRANSMITTAL LETTER
(Small Entity)

Docket No.
Copy-51

TO THE ASSISTANT COMMISSIONER FOR PATENTS

JC900 U.S. PTO 09/640514 08/17/00

Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

DiSANTO, Frank J.; KRUSOS, Denis A.; HOU, Wei-Hsin

For: **MULTI-COLOR ELECTROPHORETIC IMAGE DISPLAY**

Enclosed are:

- ☒ Certificate of Mailing with Express Mail Mailing Label No. **EJ596853046US**
- ☒ **12** sheets of drawings.
- ☐ A certified copy of a application.
- ☒ Declaration ☐ Signed. ☒ Unsigned.
- ☒ Power of Attorney
- ☒ Information Disclosure Statement
- ☐ Preliminary Amendment
- ☒ **One** Verified Statement(s) to Establish Small Entity Status Under 37 C.F.R. 1.9 and 1.27.
- ☒ Other: **Assignment; Acknowledgment Postcard**

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra		Rate	Fee
Total Claims	34	- 20 =	14	x	$9.00	$126.00
Indep. Claims	4	- 3 =	1	x	$39.00	$39.00
Multiple Dependent Claims (check if applicable) ☐						$0.00
					BASIC FEE	$345.00
					TOTAL FILING FEE	$510.00

- ☒ A check in the amount of **$510.00** to cover the filing fee is enclosed.
- ☐ The Commissioner is hereby authorized to charge and credit Deposit Account No. as described below. A duplicate copy of this sheet is enclosed.
  - ☐ Charge the amount of as filing fee.
  - ☒ Credit any overpayment.
  - ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
  - ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated: 8/17/00

Signature

Paul A. Schwarz, Esq.
Reg. No. 37,577
BUCHANAN INGERSOLL, P.C.
650 College Road East, 4th Floor
Princeton, New Jersey 08540
(609) 987-6883
(609) 520-0360 - facsimile

cc:

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"EXPRESS MAIL CERTIFICATE"

"Express Mail" mailing label number: EJ596853046US

Date of Deposit: August 17, 2000

Title of Invention: MULTI-COLOR ELECTROPHORETIC IMAGE DISPLAY

Inventor: DiSANTO, Frank J.; KRUSOS, Denis; HOU, Wei-Hsin

Type of Documents:

1. Application Transmittal;
2. Application consisting of 10 pages of specification, 6 pages of claims, 1 page of Abstract, 12 pages of drawings;
3. Declaration and Power of Attorney (unexecuted);
4. One Verified Small Entity Statement;
5. Information Disclosure Statement;
6. PTO - Form 1449;
7. IDS References;
8. Assignment;
9. Assignment Recordation Form;
10. Our checks in the amount of $510.00 and $40.00;
11. Acknowledgment Postcard; and,
12. "Express Mail" Certificate.

I hereby certify that this paper and fee are being deposited with the United States Postal Service's "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated above and is addressed to Assistant Commissioner for Patents, "Box Application," Washington, D.C. 20231.

Tammy T. Fattoross

Tammy T. Fattoross

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) AND 1.27 (c)) - SMALL BUSINESS CONCERN	Docket No. Copy-51

Serial No.	Filing Date	Patent No.	Issue Date
Herewith	Herewith	TBA	TBA

Applicant/ Patentee: **DiSANTO, Frank J.; KRUSOS, Denis A.; HOU, Wei-Hsin**

Invention: **MULTI-COLOR ELECTROPHORETIC IMAGE DISPLAY**

I hereby declare that I am:

- ☐ the owner of the small business concern identified below:
- ☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN: **CopyTele, Inc.**
ADDRESS OF CONCERN: **900 Walt Whitman Road, Melville, New York 11746**

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the above identified invention described in:

- ☒ the specification filed herewith with title as listed above.
- ☐ the application identified above.
- ☐ the patent identified above.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed on the next page and no rights to the invention are held by any person, other than the inventor, who could not qualify as an independent inventor under 37 CFR 1.9(c) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

☒ no such person, concern or organization exists.
☐ each such person, concern or organization is listed below.

FULL NAME _____
ADDRESS _____
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

FULL NAME _____
ADDRESS _____
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

FULL NAME _____
ADDRESS _____
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

FULL NAME _____
ADDRESS _____
☐ Individual ☐ Small Business Concern ☐ Nonprofit Organization

Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: **Frank J. DiSanto**

TITLE OF PERSON SIGNING OTHER THAN OWNER: **President**

ADDRESS OF PERSON SIGNING: **900 Walt Whitman Road**
Melville, New York 11746

SIGNATURE: Frank J. DiSanto. DATE: 8-16-00

MULTI-COLOR ELECTROPHORETIC IMAGE DISPLAY

FIELD OF THE INVENTION

This invention relates to electrophoretic image displays and, more particularly, to a multi-color electrophoretic image display.

BACKGROUND OF THE INVENTION

The electrophoretic effect is well known in the art as evidenced by the many patents and articles which describe this effect. In essence, the electrophoretic effect operates on the principle that when certain particles are electrically charged to a particular polarity, the charged particles will migrate away from a surface charged to the same polarity as the particles and toward a surface charged to a polarity which opposite to that of the charged particles. For example, particles which are positively charged will migrate away from a positively charged surface and towards a negatively charged surface.

Display devices which utilize the electrophoretic effect are commonly known as electrophoretic image displays (EPIDs). EPIDs are very well known in the art. The following patents issued to Frank J. Disanto and Denis A. Krusos, and assigned to Copytele, Inc., the assignee herein, are illustrative of such EPIDs.

U.S. Patent 4,655,897 entitled ELECTROPHORETIC DISPLAY PANELS AND ASSOCIATED METHODS, describes an electrophoretic display apparatus comprising an XY matrix of grid and cathode lines, an anode electrode spaced from the grid and cathode matrix, and an electrophoretic dispersion. The patent describes techniques for making such displays as well as suitable dispersions for use with such displays.

U.S. Patent 4,732,830 entitled ELECTROPHORETIC DISPLAY PANELS AND ASSOCIATED METHODS, describes methods for making electrophoretic displays as well as describing display construction and operation.

U.S. Patent 4,742,345 entitled ELECTROPHORETIC DISPLAY PANEL APPARATUS AND METHODS THEREFOR, describes improved electrophoretic display panels exhibiting improved alignment and contrast with circuitry for implementing the same as well as methods for providing such a panel.

U.S. Patent 4,746917 entitled METHOD AND APPARATUS FOR OPERATING ELECTROPHORETIC DISPLAYS BETWEEN A DISPLAY AND A NON-DISPLAY MODE, describes various biasing techniques for operating electrophoretic displays to provide writing, erasing as well as operating the display during a display and non-display mode.

U.S. Patent 4,772,820 entitled MONOLITHIC FLAT PANEL DISPLAY APPARATUS, describes methods and apparatus for fabricating flat panel displays employing electrophoretic principles to enable such displays to be biased and driven by additional circuitry.

The electrophoretic fluids used in EPIDs typically comprise white, light, or dark colored dielectric particles which are suspended in an optically contrasting fluid medium which is either clear or dark-colored, depending upon the color of the particles. See U.S. Patent 5,360,689 entitled COLORED POLYMERIC DIELECTRIC PARTICLES AND METHOD OF MANUFACTURE, issued to Hou et al., which describes black electrophoretic and light-colored electrophoretic particles formed from crystalline polymer particles using a dispersion polymerization technique. In accordance with the electrophoretic effect described above, the electrophoretic particles in the suspension liquids are caused to selectively migrate to, and

impinge upon, a transparent screen electrode, thereby displacing the fluid medium from the screen and creating the desired image.

EPIDs have many advantages over other types of flat panel displays. One advantage is that EPIDs use materials which are relatively inexpensive and thus, makes them less costly to manufacture. Another advantage of EPIDs is that the image formed on the screen remains even when power is removed. When the electrophoretic particles or dye particles are caused to move to form an image, the image will not erase and remains on the display even upon removing of power. Hence the image must be erased in the same manner as it was created, by application to the device of an electric field of opposite polarity. Thus, EPIDs have a built-in memory in the sense that the images created by the displays do not have to be refreshed such as those images produced by CRT's and other types of displays.

One drawback associated with most prior art electrophoretic displays is that they are monochromatic. This drawback severely limits the number of applications where EPIDs can be employed. Accordingly, there is a need for a multi-color EPID which is capable of reliable operation and which is economical to fabricate.

SUMMARY OF THE INVENTION

A color electrophoretic display comprising a plurality of cells each containing electrophoretic particles. Each of the cells in the plurality is capable of displaying at least one of three selected primary colors, when the particles in the cell are moved from a first rest position to a second display position on the cell. An electrode is coupled to each of the cells and is operative when biased to move the particles from the first rest position to the second display

position thereby displaying primary colors in the second display position and causing the display to provide full color capability according to particle position in the cells.

BRIEF DESCRIPTION OF THE DRAWINGS

The advantages, nature, and various additional features of the invention will appear more fully upon consideration of the illustrative embodiments now to be described in detail in connection with accompanying drawings wherein:

FIG. 1A is an exploded perspective view of a multi-color electrophoretic image display (EPID) according to a first embodiment of the invention;

FIG. 1B is a front elevational view of the multi-color EPID illustrated in FIG. 1B;

FIG. 2A is an elevational view of an anode used in the EPID of the invention illustrating anode lines formed on the inner surface of the anode;

FIG. 2B is an elevational view of the anode illustrating a color filter array formed on the outer surface of the anode;

FIG. 2C is an elevational view of the anode illustrating an alternate color filter array design formed on the outer surface of the anode;

FIG. 3A is an elevational view of a cathode used in the EPID of the invention illustrating a two dimensional array of cells formed on the inner surface of the cathode;

FIG. 3B is a perspective view of a segment of the cathode illustrating an integrated circuit for driving the pixel cells formed on the outer surface of the cathode;

FIG. 4 is a cross-sectional view through the EPID of the first embodiment of the invention;

FIGS. 5A and 5B are cross-sectional views through the EPID of the first embodiment of the invention illustrating the operation thereof;

FIG. 6 is an elevational view illustrating the cathode of an EPID according to a second embodiment of the invention;

FIG. 7A is a cross-sectional view illustrating an EPID according to a third embodiment of the invention;

FIG. 7B is an elevational view illustrating the cathode of EPID of FIG. 7A;

FIG. 7B is an enlarged view of the cathode shown in FIG. 7B;

FIG. 8A is a front elevational view of an EPID according to a fourth embodiment of the invention;

FIG. 8B is a side elevational view of the EPID of the fourth embodiment of the invention; and

FIG. 8C is an exploded view of the EPID of the fourth embodiment of the invention.

It should be understood that the drawings are for purposes of illustrating the concepts of the invention and are not to scale.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1A and 1B collectively show a multi-color electrophoretic image display (EPID) 10 according to a first embodiment of the invention. The EPID 10 comprises a pair of parallel electrodes 11, 12 sealingly assembled together with spacers 13 to form a liquid and gas sealed enclosure having a small space S between the electrodes 11, 12 (FIG. 4), and an electrophoretic fluid 14 filling the space S between the electrodes. The electrophoretic fluid 14 is conventional, comprising a dielectric liquid of a dark color, such as blue or red, having suspended therein

millions of polymer/pigment composite dielectric particles 16 (electrophoretic particles 16) of a light color, such as white or yellow, which can be charged in accordance with known techniques. The EPID 10 is typically rectangular in shape, although other geometrical configurations can be employed as well.

Electrode 11, referred to hereinafter as anode 11, is constructed from a generally planar sheet of transparent plastic or glass. As shown in FIG. 2A, the anode 11 includes parallel rows of electrically conductive, transparent electrode or anode lines 18 on an inner surface 17 thereof. The anode lines 18 are typically fabricated by depositing a thin (about 300 Angstroms in thickness) transparent layer of conductive material, such as indium-tin-oxide (ITO), on the inner surface of the sheet and selectively etching the layer to form the anode lines. This can be accomplished using conventional thin-film deposition and etching techniques.

As shown in FIG. 2B, a multi-color light filter array 20 is provided on an outer surface 19 of the anode 11. The light filter array 20 can include a two dimensional array of red, blue, and green colored filters 21. The filters 21 are typically fabricated using conventional printing or lamination techniques. Alternatively as shown in FIG. 2C, the light filter array 21 can be constructed as alternating rows of red, blue, and green colored filters 22. The filters 21 are typically colored plastic presenting primary colors red, green and blue. As is well known, such colors can provide all colors of the spectrum, as in conventional color displays.

Electrode 12, referred to hereinafter as cathode 12, is constructed from a generally planar sheet of plastic or glass. As shown in FIG. 3A, the inner surface 23 of the cathode 12 defines a two dimensional array 24 of cells 25 which resembles an egg-crate structure. Each cell 25 of the array includes one or more side walls 26 (four side walls 26 are illustrated in the embodiment of FIG. 3A) which project generally perpendicularly from the inner surface 23 of the cathode 12.

The floor of each cell includes an electrode pad 27 formed by a coating of an electrically conductive material such as ITO. The electrode pads 27 can be deposited using conventional semiconductor deposition techniques.

As shown in the cross-sectional view of FIG. 4, each cell 25 of the array 24 is filled with a portion of the electrophoretic fluid 14 and a corresponding portion of the electrophoretic particles 16 dispersed therein, and is operative as one pixel cell for imaging. The cells 25 tend to isolate the electrophoretic particles 16 from each other, therefore, significantly improving the electrical, colloidal, operational, and life-time stability of the EPID 10. Moreover, the cells 25 can be easily dimensioned to provide hundreds of pixels per inch, thereby enabling one to obtain extremely fine resolution, hence creating high resolution display capabilities which exceed the resolution of present commercially available display.

As shown in FIG. 3B, an integrated circuit 30 for driving the pixel cells 25 is formed on an outer surface 29 of the cathode 12. The drive circuit 30 is conventional in design and operation and includes a plurality of diode or transistor amplifiers 31 which are interconnected by electrically conductive lines 32 made for example from ITO. The drive circuit 30 can be fabricated on the outer surface 29 of the cathode 12 using well known integrated circuit manufacturing techniques.

As shown in the cross-sectional view of FIG. 4, an electrically conductive through-hole or via 33, extends through the cathode and electrically connects the electrode pad 27 of each cell 25 to one of the wires 32 of the drive circuit 30 formed on the outer surface 29 of the cathode 12, thereby permitting each cell 25 to be electrically driven. As one of ordinary skill in the art will recognize, by applying proper biasing potentials on the respective amplifiers 31, a biasing potential is created between the anode and cathode 11, 12 which will cause the electrophoretic

particles 16 in any cell 25 to move between the anode and the cathode 11, 12 in accordance with the electrophoretic effect. For example, if the electrophoretic particles 16 are initially disposed in their associated cells 25 of the cathode 12 (adjacent from corresponding positions on the anode lines 18) attracted there by their charge, which is opposite to the applied voltage, reversal of the sign of the applied voltage will cause these particles 16 to move to their corresponding positions on the anode lines 18 of the anode 11. If the electrophoretic particles 16 are initially disposed on the anode lines 18 of the anode 11 (adjacent their associated cells 25) attracted there by their charge, which is opposite to the applied voltage, reversal of the sign of the applied voltage will cause these particles 16 to move to their associated cells 25 of the cathode 12.

As shown in FIGS. 5A and 5B, when the electrophoretic particles 16 within each cell 25 are electrically driven to a corresponding position on the anode lines 18 of the anode 11 where they remain, the particles 16 on the anode 11 generate a reflective surface thereunder that reflects incoming light passing through each cell's 25 respective color filter 21 to produce red, blue, and green light. By combining the appropriate number of cells 25 producing red, blue, and green light, a multi-color image can be produced including multi-color alpha numeric characters or graphics, such as television pictures.

Referring again to FIG. 4, the spacers 13 are sealed to the inner surfaces of the anode and cathode 11, 12 around the perimeter of the display using conventional sealing methods. The spacers 13 have a thickness T which is at least 1 mil thicker than the height H of the cell walls 26 which creates a gap G between the inner surface 17 of the anode 11 and the free edges of the cell walls 26. This gap G permits the electrophoretic fluid 14 to flow into and fill up each cell 25 of the cathode 12 when the EPID 10 is filled with the fluid 14.

In a second embodiment of the EPID of the invention, the inner surface 23 of the cathode 12, as shown in FIG. 6, defines parallel rows 51 of elongated cells instead of an egg-crate structure as in the first embodiment. Each elongated cell 51 operates as a line or row pixel. The light filter array (not shown) used in this embodiment can be constructed as described in FIG. 2C with alternating lines of red, blue, and green colored filters, each of which operates as a light filter for a corresponding one of the cells 51.

FIGS. 7A-7C collectively illustrate the EPID 70 according to a third embodiment of the invention. In this embodiment, the cathode 12 essentially omits the cell side walls which project from the inner surface 23 thereof in the previous embodiments. This allows the drive circuit 30, which includes the electrically conductive metal lines 32 that electrically interconnect the diodes or transistors 31 disposed between the pixels, to be formed on the inner surface 23 of the cathode 12 along with the electrode pads 27 so that the electrically conductive through-holes used in the previous embodiments can be eliminated. Electrically conductive contact pads 71, which connect the drive diodes or transistors 31 to a driver chip, are also formed on the inner surface 23 of the cathode 12 adjacent opposing edges of the cathode 12.

FIGS. 8A-8C collectively illustrate an EPID 60 according to a fourth embodiment of the invention. In this embodiment, the EPID 60 is constructed by combining three individual EPIDs 61, 62, 63 together in a face-to-face manner. The front, middle, and rear EPIDs 61, 62, 63 can be constructed essentially as described above in the previous embodiments, but without the filter arrays. Each EPID 61, 62, 63 contains electrophoretic particles preferably of one of the primary colors red, blue, and green. For example, EPID 61can contain red particles, EPID 62 can contain blue particles, and EPID 63 can contain green particles. Thus, the front EPID 61 displays only

red light, the middle EPID 62 displays only blue light, and the rear EPID 63 displays only green light.

Further, the cells or pixels 64, 65, 66 of the EPIDs 61, 62, 63 are oriented so that the light produced by the cells or pixels 65, 66 of the middle and rear EPIDs 62, 63 can be view through the front EPID 61. This can be accomplished, as shown in FIG. 8C, by spacing apart the cells or pixels 64, 65, 66 in each of the EPIDs 61, 62, 63 and by aligning the cells 64, 65, 66 of the front, middle, and rear EPIDs 61, 62, 63 in an offset manner. Additionally, both of the electrodes in at least the front and middle EPIDs 61, 62, 63 are constructed from transparent plastic or glass sheets and employ transparent electrode lines and electrode pads.

In operation, the EPID 60 combines the appropriate number of red, blue, and green cells 64, 65, 66 from the front, middle, and rear EPIDs 61, 62, 63 to produced a multi-color image which is viewed through the front EPID 61.

While the foregoing invention has been described with reference to the above embodiments, various modifications and changes can be made without departing from the spirit of the invention. Accordingly, all such modifications and changes are considered to be within the scope of the appended claims.

CLAIMS

What is claimed is:

1. A multi-color electrophoretic image display, comprising:

a first electrode defining a plurality of cells;

a transparent second electrode separated from the first electrode by a space;

an electrophoretic fluid disposed in the space between the first and second electrodes, the electrophoretic fluid including a plurality of electrophoretic particles dispersed in the cells of the first electrode, the electrophoretic particles in the cells being electrophoretically movable to and from adjacent positions on the transparent second electrode;

wherein the electrophoretic particles, in selected ones of the cells that have been electrophoretically moved to their adjacent positions on the transparent second electrode, reflect light entering the display thereby forming an image which can be more than one color.

2. The display according to claim 1, wherein the transparent second electrode includes rows of electrically conductive, transparent electrode lines.

3. The display according to claim 1, wherein the cells define electrically conductive electrode pads.

4. The display according to claim 3, wherein the electrode pads are elongated.

5. The display according to claim 1, wherein the cells are elongated.

6. The display according to claim 1, wherein the transparent second electrode includes a multi-color light filter array that filters and thereby colors the light reflected by the electrophoretic particles.

7. The display according to claim 6, wherein the filter array includes blue, red, and green filters.

8. The display according to claim 1, wherein the electrophoretic particles are of a light color.

9. The display according to claim 1, wherein the electrophoretic particles are polymer coated.

10. The display according to claim 1, wherein the first electrode includes a plastic planar member having an inner surface and an outer surface, the inner surface defining each of the cells.

11. The display according to claim 1, wherein the transparent second electrode includes a transparent plastic planar member having an inner surface and an outer surface, the outer surface having a multi-color light filter array disposed thereon.

12. The display according to claim 1, further comprising a spacer joining the first and second electrodes, wherein the electrophoretic fluid is retained in the space between the electrodes by the spacer.

13. The display according to claim 12, wherein the spacer is slightly taller than the cells.

14. The display according to claim 1, wherein each of the cells forms a pixel.

15. A multi-color electrophoretic image display comprising pixels of at least two different colors, the pixels defined by electrophoretic particle containing cells formed on an electrode, wherein the electrophoretic particles, in selected ones of the cells that have been displayed, reflect light entering the display thereby forming an image which can be more than one color.

16. The display according to claim 15, further comprising a second transparent electrode, the electrophoretic particles in the cells being electrophoretically movable to and from adjacent positions on the transparent second electrode.

17. The display according to claim 16, wherein the transparent second electrode includes a multi-color light filter array that filters and thereby colors light reflected by the electrophoretic particles.

18. A multi-color electrophoretic display, comprising:

a first set of pixels including electrophoretic particles which display a first color;

a second set of pixels including electrophoretic particles disposed adjacent the first set of pixels, the second set of pixels displaying a second color different from the first color; and

wherein the particles of the first and second set of pixels are selectively displayed to provide an image which can be more than one color.

19. The display according to claim 18, further comprising a third set of pixels adjacent the first and second set of pixels, the third set of pixels including electrophoretic particles which display a third color different from the first and second colors.

20. The display according to claim 19, wherein the first, second, and third sets of pixels are disposed in the same plane.

21. The display according to claim 19, wherein the first, second, and third sets of pixels are disposed in different planes.

22. The display according to claim 18, wherein the first and second sets of pixels are disposed in the same plane.

23. The display according to claim 19, wherein the first and second sets of pixels are disposed in different planes.

24. The display according to claim 18, further comprising a multi-color light filter array that filters and thereby colors the light displayed by the electrophoretic particles of the first and second sets.

25. The display according to claim 24, wherein the filter array includes filters selected from the group consisting of blue light filters, red light filters, and green light filters.

26. The display according to claim 18, wherein the electrophoretic particles of the first set are selected from the group consisting of blue electrophoretic particles, red electrophoretic particles, and green electrophoretic particles and the electrophoretic particles of the second set are selected from the group consisting of blue electrophoretic particles, red electrophoretic particles, and green electrophoretic particles.

27. The display according to claim 18, wherein the electrophoretic particles are of a light color.

28. A color electrophoretic display, comprising:

a plurality of cells each containing electrophoretic particles, with each cell in the plurality capable of displaying at least one of three selected primary colors, when the particles in the cell are moved from a first rest position to a second display position on the cell,

an electrode coupled to each of the cells and operative when biased to move the particles from the first rest position to the second display position to cause the primary colors to

be displayed in the second display position to thereby cause the display to provide full color capability according to particle position in the cells.

29. The display according to claim 28, further comprising a multi-color light filter array that filters and thereby colors the light displayed by the electrophoretic particles.

30. The display according to claim 29, wherein the filter array includes blue, red, and green light filters.

31. The display according to claim 28, wherein the electrophoretic particles are of a light color.

32. The display according to claim 28, wherein the electrophoretic particles are at least three different colors, the particles in any given one of the cells being of the same color.

33. The display according to claim 28, wherein the cells are disposed in the same plane.

34. The display according to claim 28, wherein the cells are disposed in different planes.

ABSTRACT OF THE DISCLOSURE

A color electrophoretic display including a plurality of cells each containing electrophoretic particles. Each of the cells in the plurality is capable of displaying at least one of three selected primary colors, when the particles in the cell are moved from a first rest position to a second display position on the cell. An electrode is coupled to each of the cells and is operative when biased to move the particles from the first rest position to the second display position thereby displaying primary colors in the second display position and causing the display to provide full color capability according to particle position in the cells.

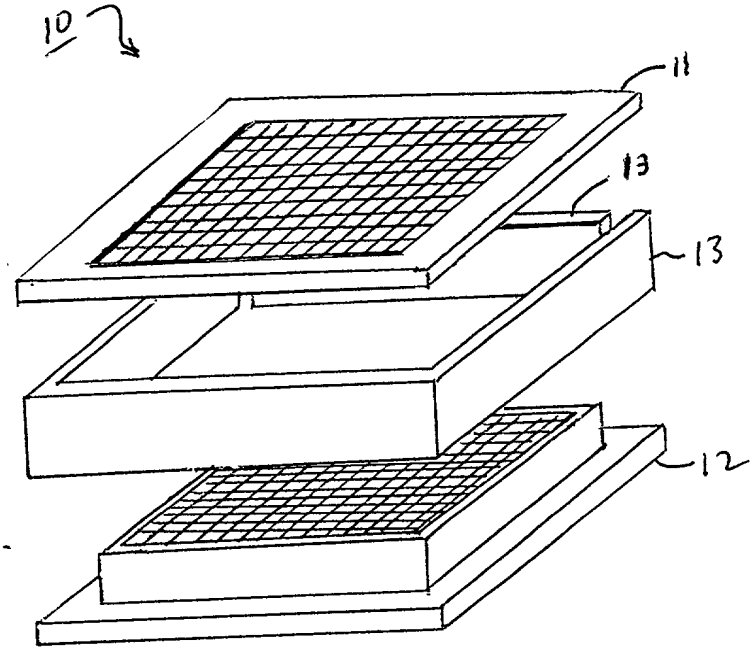

Fig. 1A

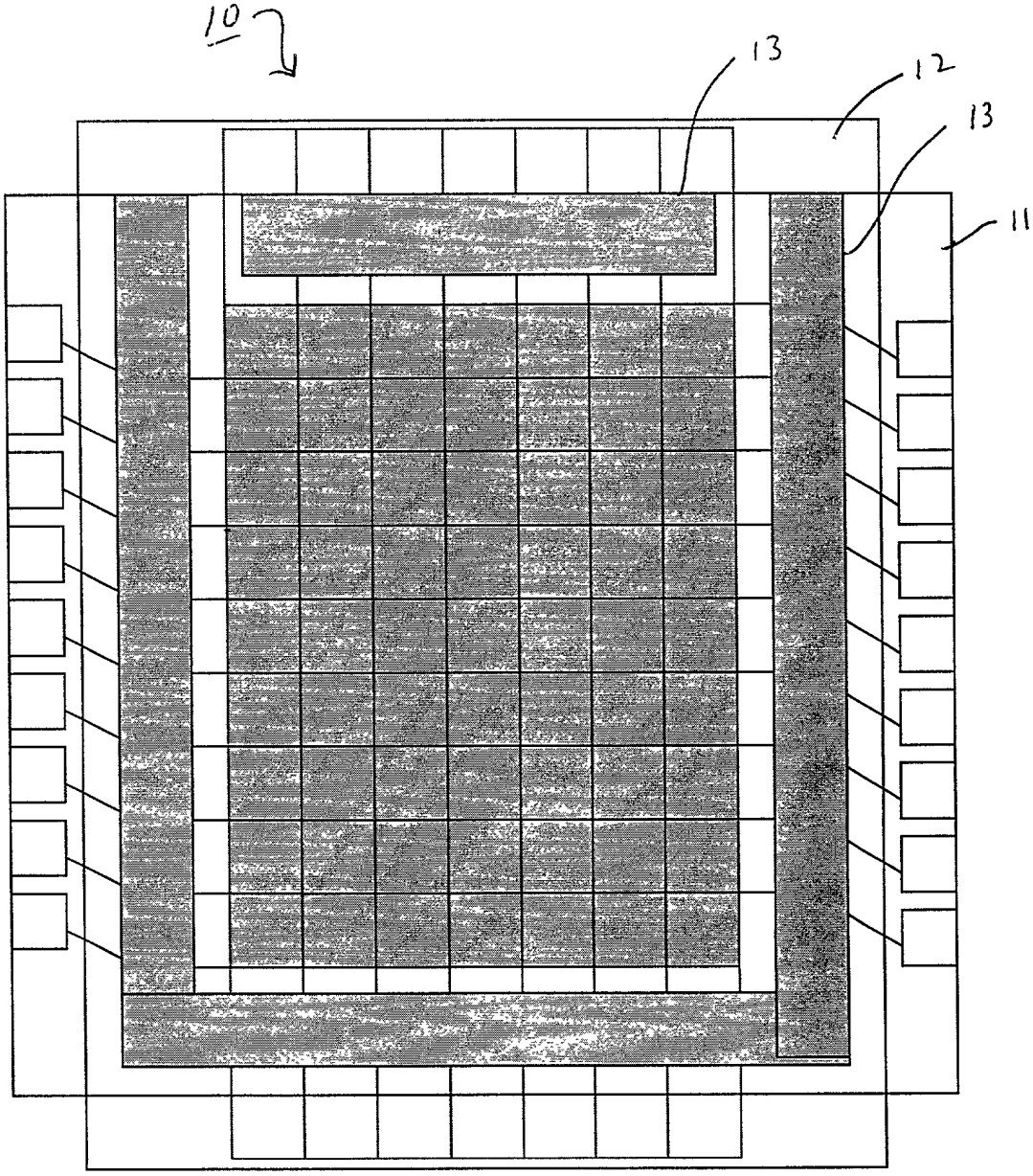

Fig. 1B

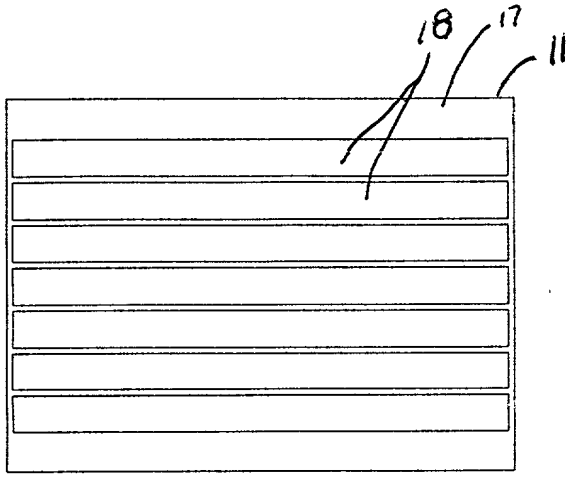

Fig. 2A

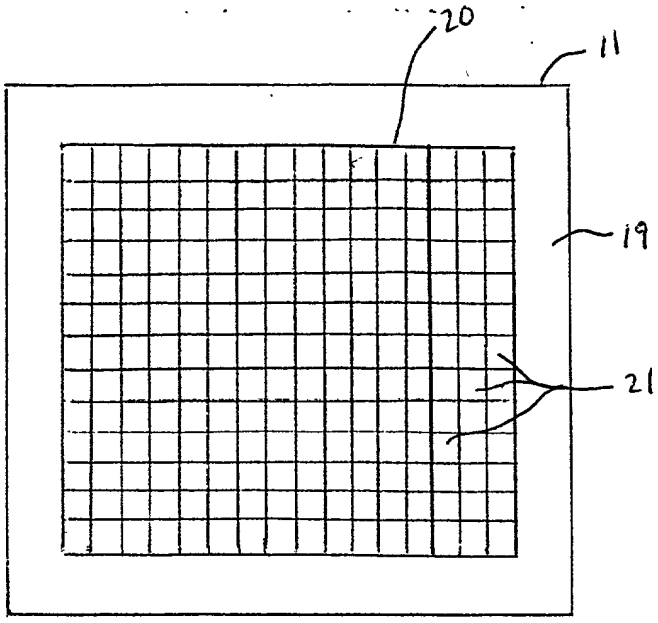

Fig. 2B

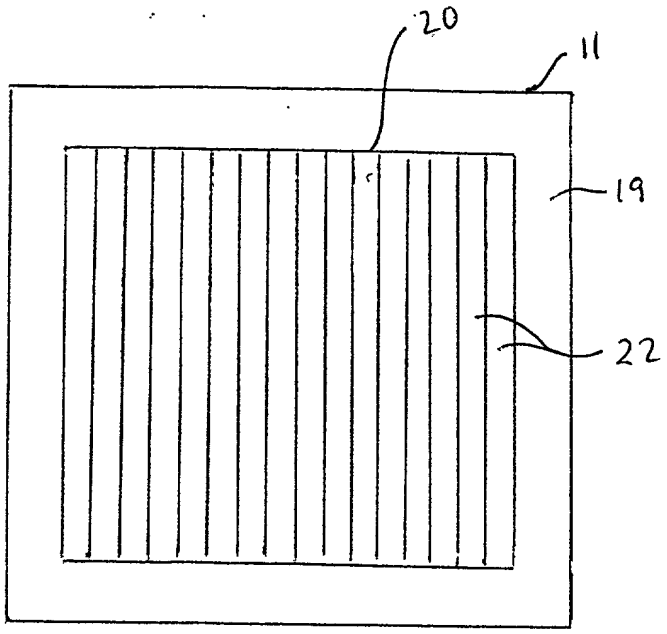

Fig. 2C

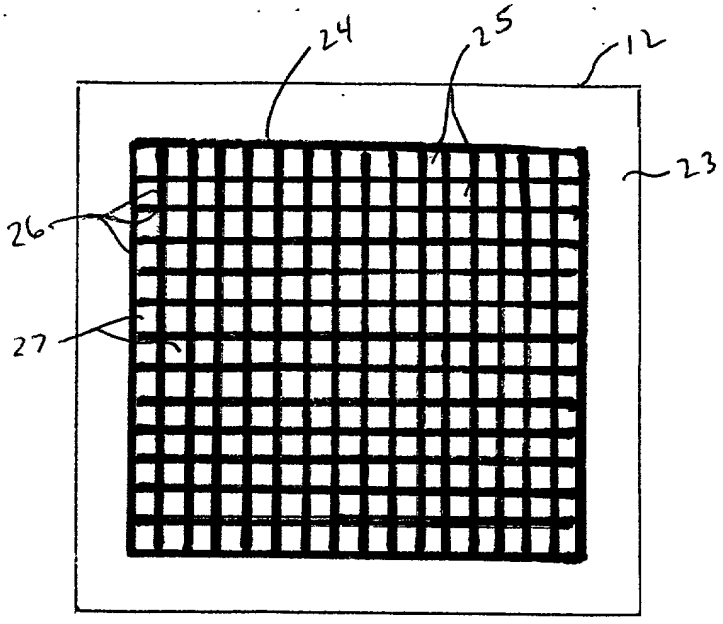

Fig. 3A

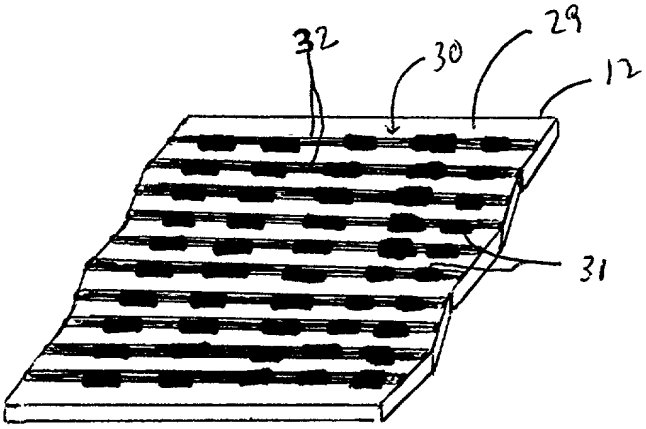
32
30
29
12
31

Fig. 3B

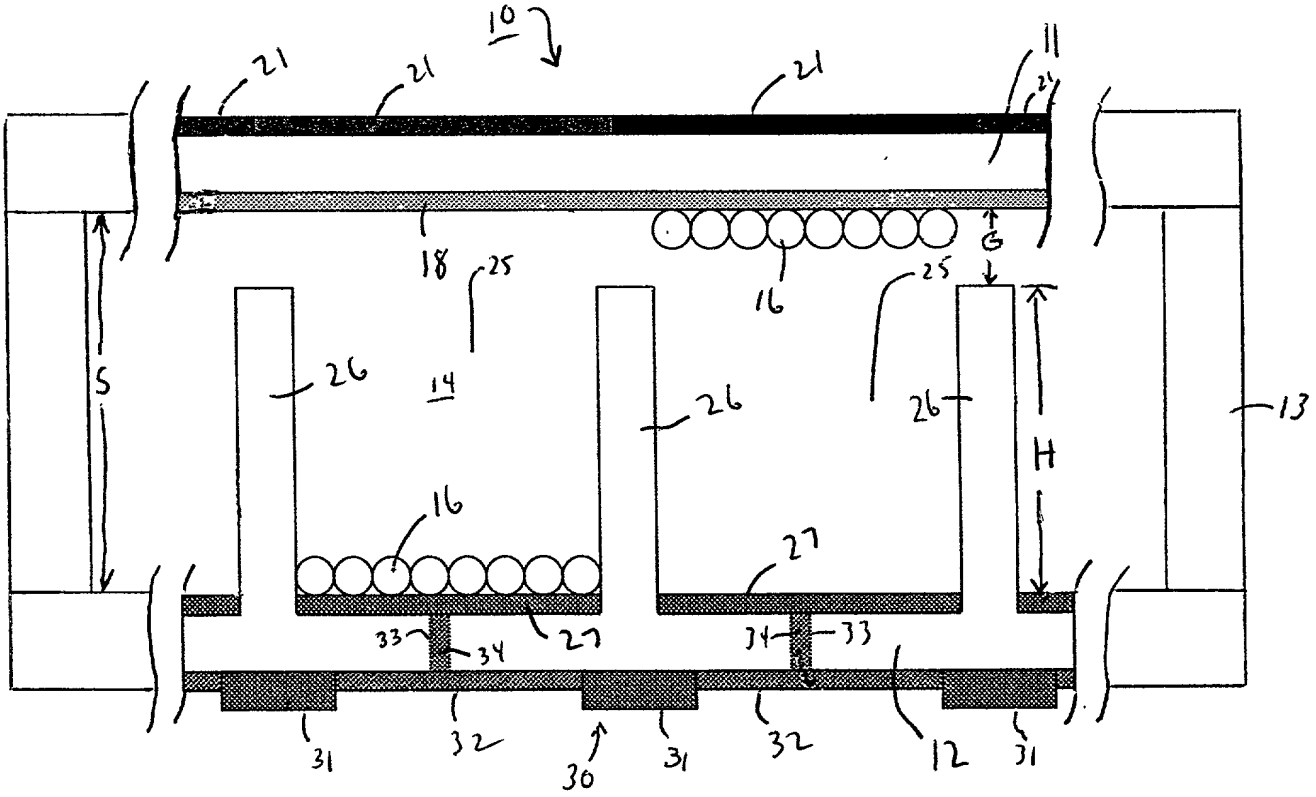
10
21
21
21
11
21
18
25
16
G
25
S
26
14
26
26
H
13
16
27
33
34
27
34
33
31
32
30
31
32
12
31

Fig. 4

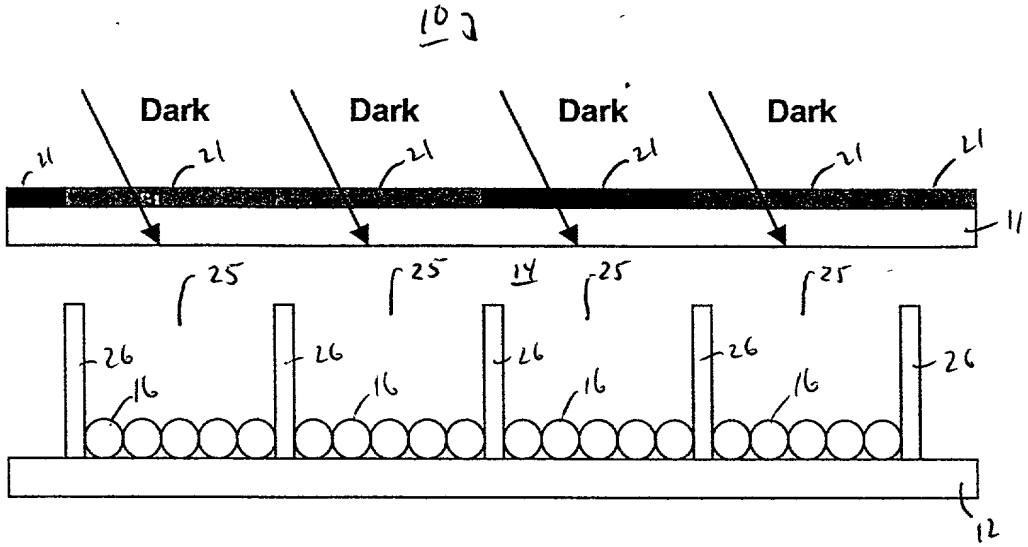
10
Dark
Dark
Dark
Dark
21
11
25
14
26
16
12

Fig. 5A

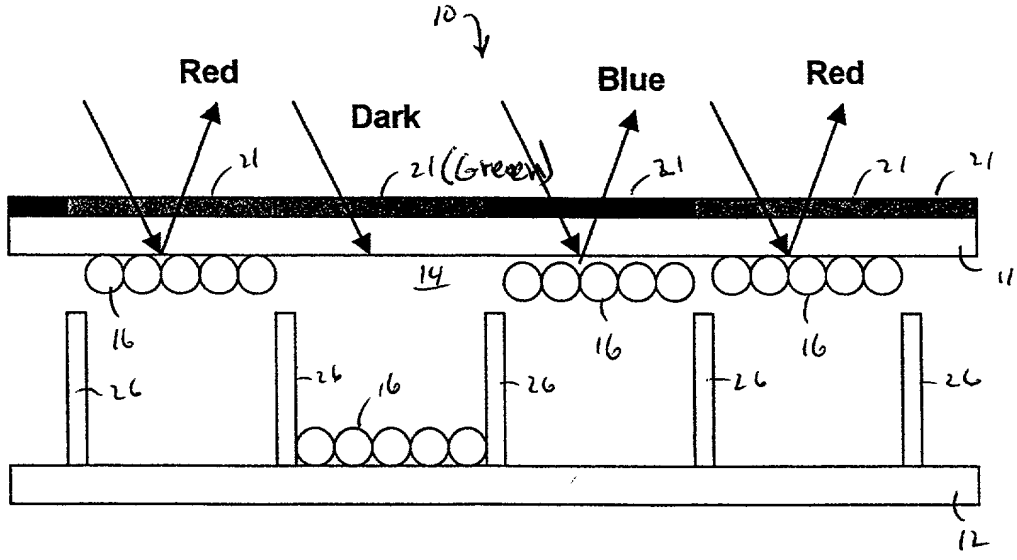
10
Red
Dark
Blue
Red
21
21 (Green)
14
11
16
26
12

Fig. 5B

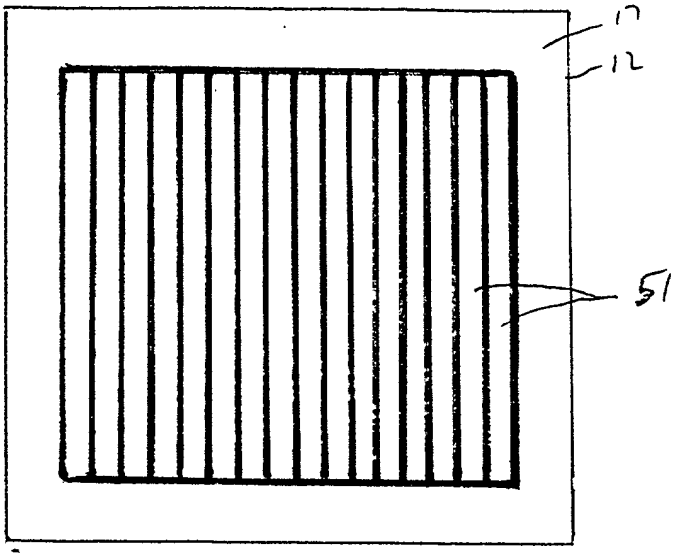

Fig. 6

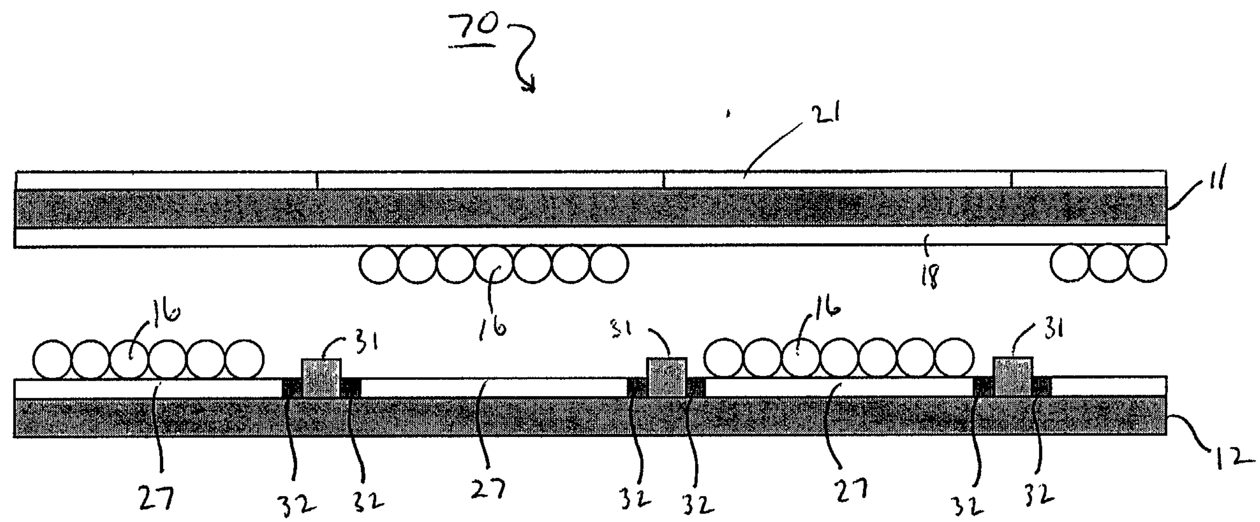

Fig. 7A

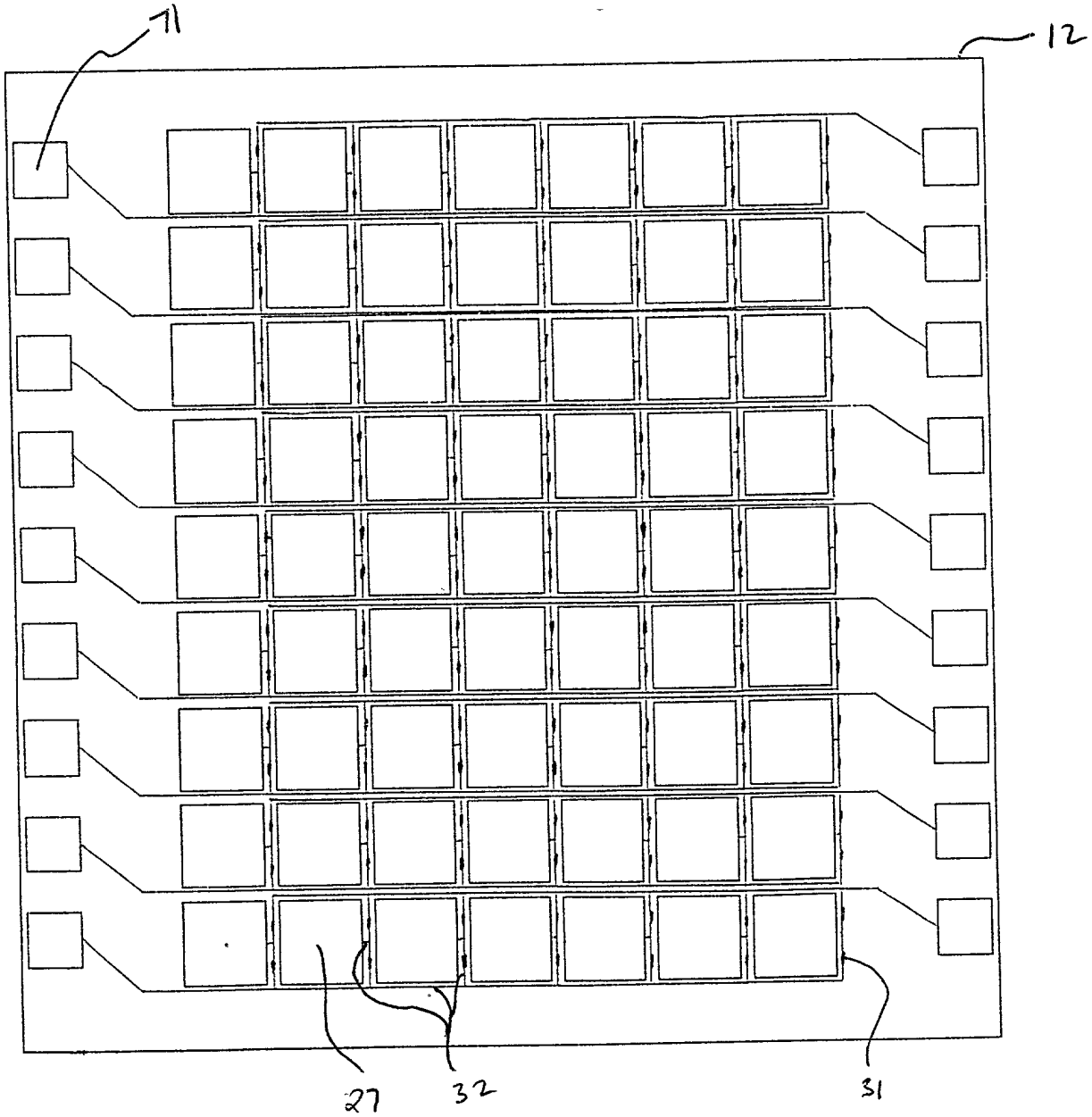

Fig. 7B

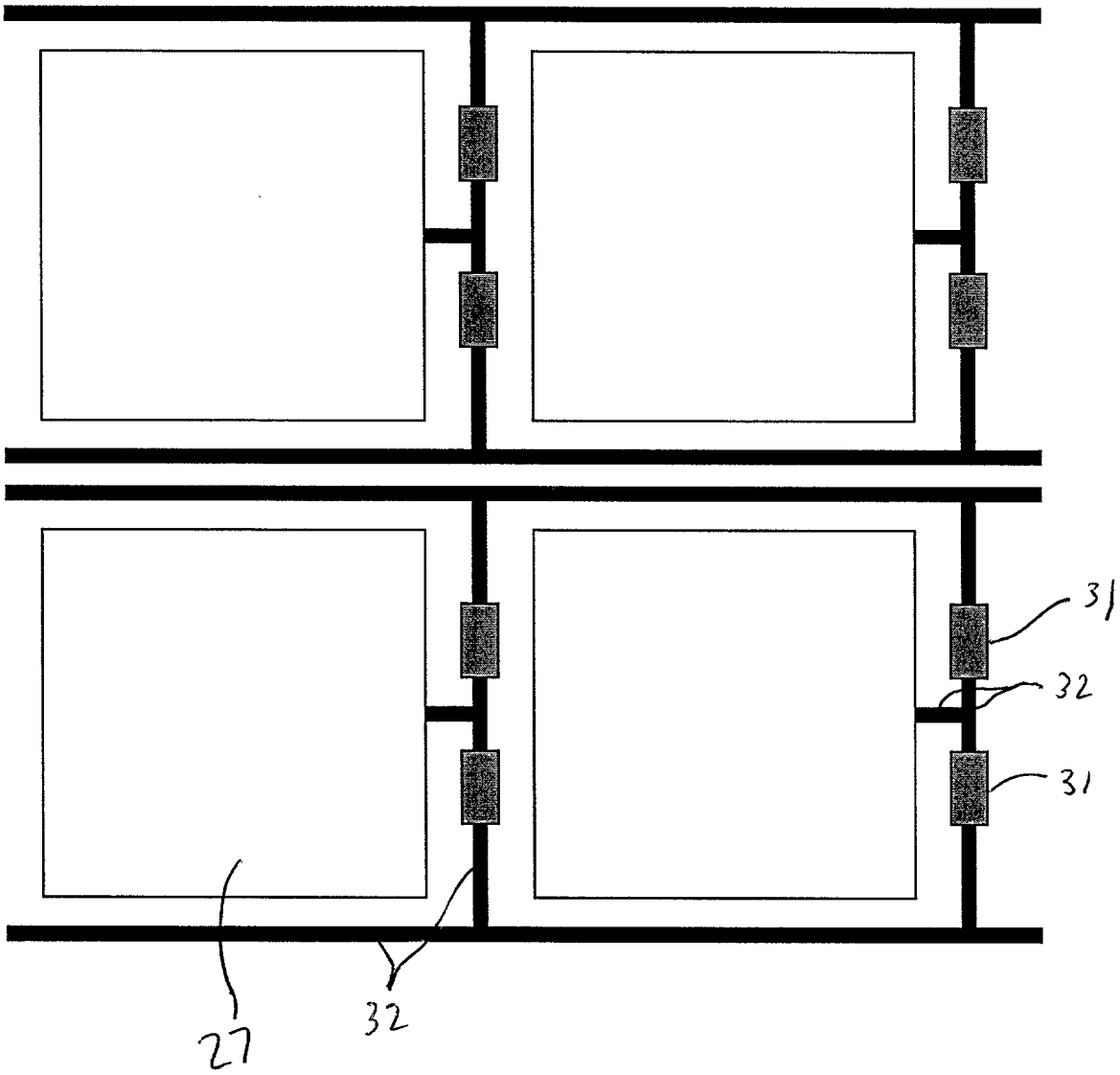

Fig. 7C

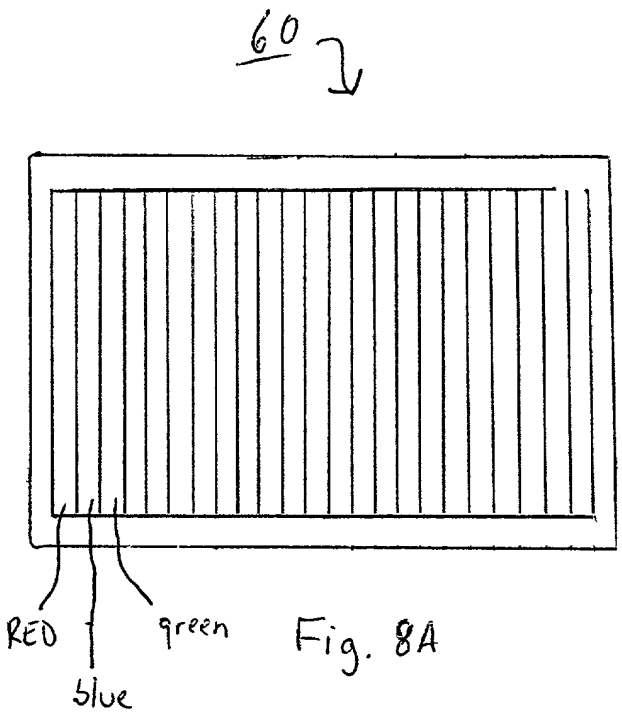

Fig. 8A

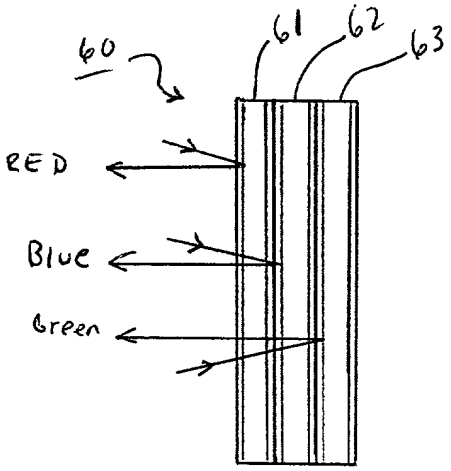

Fig. 8B

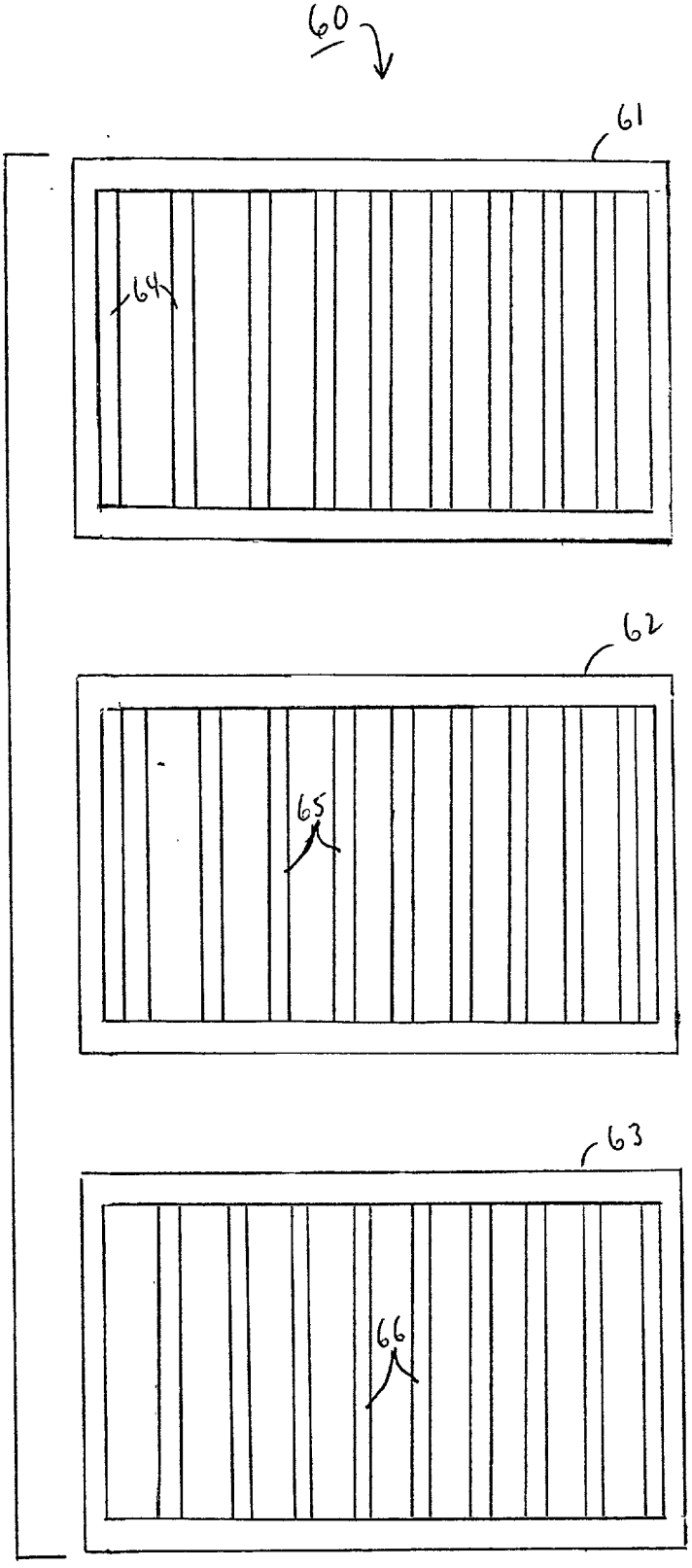

Fig. 8C

Docket No.
Copy-51

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MULTI-COLOR ELECTROPHORETIC IMAGE DISPLAY

the specification of which
(check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. or PCT International Application Number _____

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Not Claimed
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	☐
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	☐
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	☐

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

Arthur L. Plevy	**24,277**	**all of the Firm:**
Edward J. Howard	**42,670**	**BUCHANAN INGERSOLL, P.C.**
Jonathan M. Darcy	**44,054**	**650 College Road East, 4th Floor**
Paul A. Schwarz	**37,577**	**Princeton, New Jersey 08540**
Jane E. Alexander	**36,014**	

Send Correspondence to: **Arthur L. Plevy, Esq.**
BUCHANAN INGERSOLL, P.C.
650 College Road East, 4th Floor
Princeton, New Jersey 08540

Direct Telephone Calls to: *(name and telephone number)*
Arthur L. Plevy (609) 987-6880

Full name of sole or first inventor
Frank J. DiSanto

Sole or first inventor's signature — Date

Residence
North Hills, New York

Citizenship
US

Post Office Address
27 Par Court

North Hills, New York 11030

Full name of second inventor, if any
Denis A. Krusos

Second inventor's signature — Date

Residence
Lloyd Harbor, New York

Citizenship
US

Post Office Address
1 Lloyd Harbor Road

Lloyd Harbor, New York 11743

Full name of third inventor, if any	**Wei-Hsin Hou**
Third inventor's signature	Date
Residence	Seatauket, New York
Citizenship	United States
Post Office Address	46 Buckingham Meadow Road
	Seatauket, New York 11733

Full name of fourth inventor, if any	
Fourth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

Full name of fifth inventor, if any	
Fifth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	

Full name of sixth inventor, if any	
Sixth inventor's signature	Date
Residence	
Citizenship	
Post Office Address	